Assessment and subject description

Óbuda University Kandó Kálmán Faculty of Electrical Engineering			Institute of Microelectronics and Technology		
Subject name and code**: Digital Technics II KEXDT2ABNE** **Credits: 3+3** **Full-time, Spring Semester 2018/2019**					
Course: BSc in Electrical Engineering					
Responsible:	Dr. Kovács Balázs, CSc, associate professor	Teaching staff:	Dr. Bálint Pődör, CSc (honorary) full professor		
Prerequisites:	Digital technics I				
Contact hours per week:	Lecture: **2**	Class discussion: **1**	Lab hours: **0**	Tutorial: **0**	
Assessment and evaluation:	**exam**				

Subject description

Aims:
This course will give an overview of the basic concepts and applications of digital technics, from Boolean algebra to microprocessors. The aim is to acquaint the future electrical engineers with the fundamentals of digital technics, with the digital circuits, and with their characteristics and applications. In the course of three-semester lectures, classroom-tutorials and laboratory exercises the future electrical engineer should acquire solid knowledge and sufficient proficiency in the functioning, operation, design and applications of digital systems.

Topics to be covered:
Sequential circuits, general concepts and properties, synchronous and asynchronous operation. elementary sequential circuits, flip-flops. Analysis and synthesis of sequential circuits. Sequential functional blocks, registers, counters. Logic circuit generations and families, general properties. Implementation technologies, bipolar (TTL, ECL), FET (CMOS). Programmable logic devices. Arithmetic circuits, combinational and sequential. Semiconductor memories, properties, addressing. Microprocessor basics, arithmetic logic units, datapaths, interfaces, interrupt.

Topics	Week	Lessons
Sequential logic circuits, fundamental concepts and properties. State transition tables, state transition diagrams. Asynchronous and synchronous operation.		**2**
Elementary sequential circuits: flip-flops. RS, JK, D, G-D, and T type flip-flops I.		**2**
Elementary sequential circuits: flip-flops. RS, JK, D, G-D, and T type flip-flops II.		**2**
Sequential functional blocks: registers, register-based counters, asynchronous and synchronous counters I.		**2**
Sequential functional blocks: registers, register-based counters, asynchronous and synchronous counters II.		**2**
Analysis and synthesis of sequential circuits. Synthesis based on next state tables.		**2**
Synthesis of synchronous sequential circuits: 4-bit parity checker, 4-bit Gray code counter.		**2**
Logic circuits I. Basic principles (logic families, inverter). MOS circuits. CMOS logic, principles, CMOS technology. Basic CMOS gates, pass transistor logic.		**2**
Logic circuits II. Logic circuit generation and families. Bipolar and TTL. Schottky technology.		**2**
Logic circuits III. BiCMOS circuits, ECL circuits. General comparison and evaluation of different logic circuits and technologies.		**2**
Semiconductor memories. Classification, technologies, properties and applications.		**2**
Microprocessors I. Carry-look ahead and carry select adders, parallel multipliers. Series arithmetic circuits: adders and multipliers. Arithmetic logic unit: structure and properties.		**2**
Microprocessors II. Elementary concepts, structure, bus system, operation, handling of peripheries, interruption system.		**2**
End-of-term review.		**2**

Classroom practice subjects		
Synthesis of combinational circuits: design examples and case studies.		**2**
Analysis and synthesis of synchronous sequential circuits: examples. Case studies: 4-bit parity indicator, Gray-code counter		**2**
Applications examples of synchronous sequential circuits and counters.		**2**
Analysis of operation of and applications of TTL and CMOS basic gates and functional elements I.		**2**
Analysis of operation of and applications of TTL and CMOS basic gates and functional elements II.		**2**
Analysis and applications of semiconductor memories.		**2**

Assessment and evaluation

Requirements of the signature:

The attendance of the lectures and classroom practices is compulsory. Students whose absence from lectures or classroom practices exceeds the limits stipulated in the Rules and Regulations of the University cannot be admitted to examination.

The coursework comprises several home assignments and a written mid-term test. The home assignments should be submitted in a form of technical report (hard copy on A4 sheets or electronic file) on the deadlines set. The condition for admission to examination, besides the above rules concerning lecture attendance, is the submission of all home assignments and at least a *pass* mark (2) in the mid-term test.

Type of exam:

Written and supplementary oral examination at the end of the semester.

The threshold for pass mark (including the results of home assignments and mid-semester test) is 55 %.

Evaluation of the exam:

The results of home assignments and of the test will be appropriately incorporated in the final grade. Weighing (app.): home assignments results 30 %, mid-term test result 20%, and exam paper 50 %.

Suggested material

Any good recent English language textbook.

Bálint Pődör: *Digital technics II* lecture files (updated), University E-learning (Moodle) system, earlier version available also from the homepage of the Microelectronics and Technology Institute, *mti.kvk.uni-obuda.hu*

Bálint Pődör: *Digital technics* (course materials for final year elective English language course), available from the homepage of the Microelectronics and Technology Institute, *mti.kvk.uni-obuda.hu*

Comment: